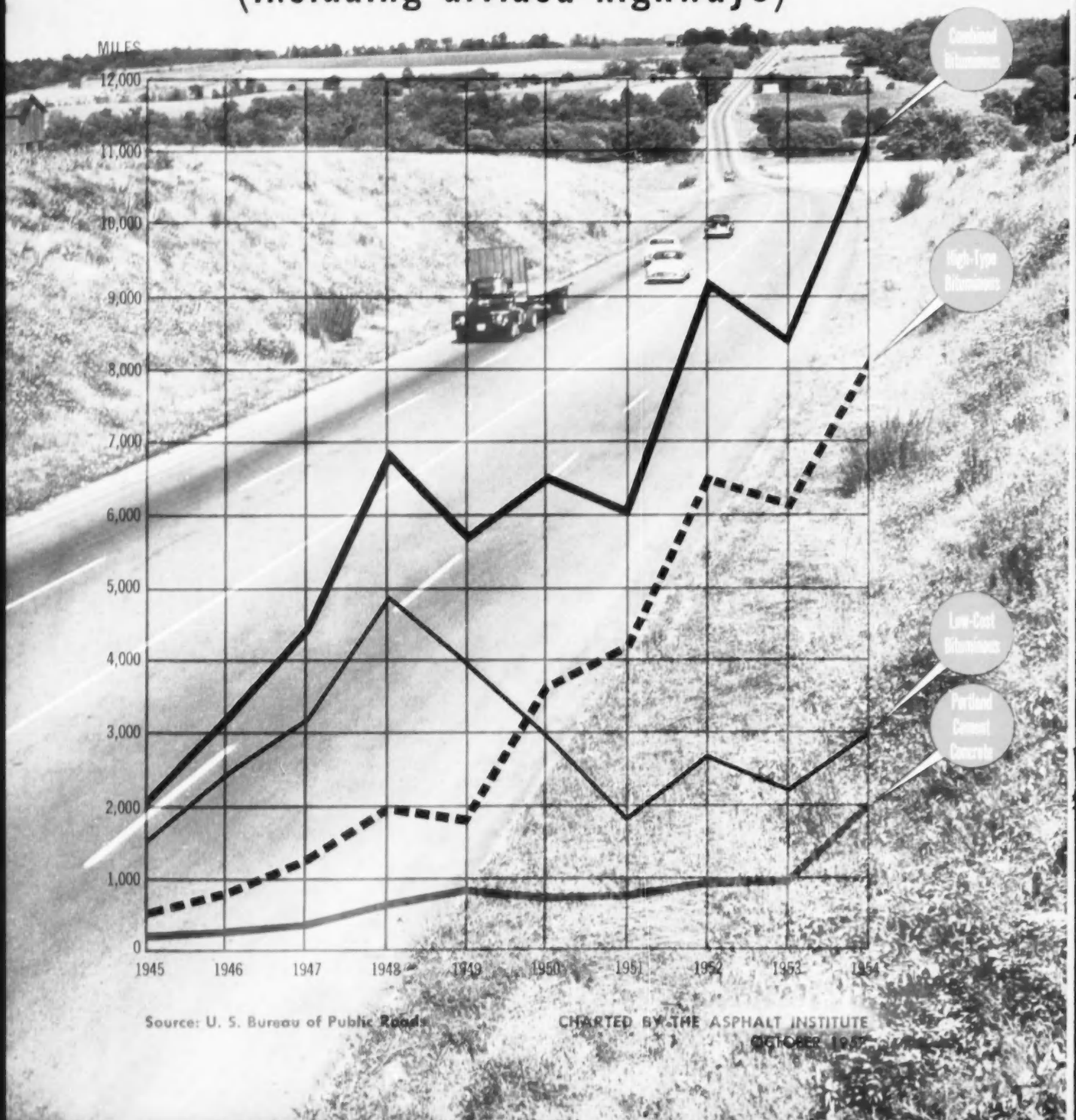
ASPHALT INSTITUTE

Quarterly

OCTOBER, 1957

Pavement Mileage Built Annually on State Highways over 22 feet wide (including divided highways)



Source: U. S. Bureau of Public Roads

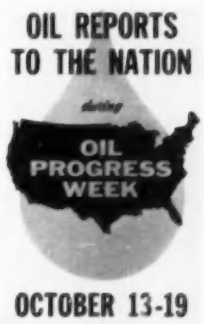
CHARTED BY THE ASPHALT INSTITUTE
OCTOBER 1955

ASPHALTOPICS

A major manufacturer of corrugated metal culvert pipe now markets a culvert pipe in which all interior corrugations are filled with asphalt. This provides a smooth, internal surface that materially reduces resistance to the flow of water. Such manufacturers annually use several thousand tons of asphalt for this purpose.

For every engineer engaged in heavy-duty highway construction, the new Asphalt Institute publication *Specifications and Construction Methods for Hot-Mix Asphalt Paving* (Specification Series No. 1) is a "must." Published last May, this 96-page book brings together in a concise and logical relationship all recognized and proven types of hot-mix asphalt paving. It is designed to aid highway engineers in the analysis, design and control of asphalt paving projects to the end that completed work will represent the highest skill and good judgment commensurate with the exacting standards of the engineering profession. Available through your nearest Asphalt Institute office.

The American Society for Testing Materials has recently announced the release of the 6th edition of *ASTM Standards on Bituminous Materials for Highway Construction, Waterproofing, and Roofing (With Related Information)*. Contained in the 460-page volume are specifications, test methods, recommended practices, and definitions of terms pertaining to bituminous materials used in highway construction and roofing and waterproofing. There are 112 standards in the compilation, 17 of which are new or revised since the previous edition was published in December 1955. Copies at $4.75 each are available at ASTM Headquarters, 1916 Race Street, Philadelphia 3, Pennsylvania.



"With today's gasoline . . . YOU'RE DRIVING A BARGAIN." This is the 1957 theme of Oil Progress Week, October 13-19, when the oil industry reports to the Nation. Pointed out will be the healthy competition within the oil industry that accounts for one of the big reasons why the gasoline dollar stretches further. There are 42,000 independent oil companies competing with one another to produce some 2,500 oil-derived products, including petroleum asphalt . . . and to find new ones. Along the nation's highways are 181,700 independently owned or operated service stations ready to provide courteous service. All this adds up to bring about a favorable business climate, which keeps the price of gasoline at competitive levels.

There is no life-span for asphalt pavements. By economical stage construction methods, engineers can build them to last indefinitely. Asphalt Pavements—the only pavements that literally GROW with America.

ASPHALT PAVES OUR FINEST HIGHWAYS

ASPHALT INSTITUTE Quarterly

Volume 9, No. 4, October, 1957

EDITOR
Richard C. Dresser

●

Contents

	PAGE
"Aspirin Oval"	4
The Quiet Revolution in Roadbuilding	7
Extra Added Attractions for Drive-Ins	8
Proven Asphalt Design on U.S. 99	10
Auto Racing at Its Best—on Asphalt	12
A Successful Summer of Advanced Asphalt Study at University of California	14
The Road Program on Display	14
Members and Offices of The Asphalt Institute	15

Cover

The success of asphalt as a paving surface for automobile racing is aptly pointed up at the multi-action track on the Wisconsin State Fair Grounds near Milwaukee. Since 1954, when the heavy-duty asphalt surface replaced the old dirt oval, records have soared in attendance, speed and safety. The cover picture shows a view of the grandstands and a portion of the one-mile track with drivers and mechanics preparing for the next race. See story on page 12.

The Asphalt Institute Quarterly is published by The Asphalt Institute, an international, nonprofit association sponsored by members of the asphalt industry to serve both users and producers of asphaltic materials through programs of engineering, research and education.

The member companies of the Institute, who have made possible the publication of this magazine, are listed on page 15.

●

Articles may be reprinted with credit line. Correspondence should be addressed to the Asphalt Institute Quarterly, Asphalt Institute Building, University of Maryland, College Park, Maryland.

A complex system of counterweights and a steel cable strung to a tractor on the embankment rim guide a 10-ton roller as it uniformly compacts the newly laid asphalt mix.

Photo: McLaughlin & Co., Phoenix

OVAL

A stock model test car glides effortlessly over the velvet smoothness of the precision-made asphalt track at the Ford Motor Co. Proving Grounds, Kingman, Arizona.

Out there on the desert rim of Arizona, where the fabled Atchison, Topeka & Santa Fe snakes its way down the Sacramento Wash to the Colorado, the jack-rabbits have developed an inferiority complex.

It wasn't always like this. Time was when the jack could walk away from anything that moved in that country—except maybe the Santa Fe trains.

Then the Ford Motor Company selected a spot on its vast proving ground near the sleepy town of Yucca and declared: "Here we will build the finest precision high-speed test track in the world." And they did.

Today, factory-fresh stock models whistle around an asphalt-paved oval at speeds up to 140 miles an hour and the rabbits have stopped giving it the old college try. They prefer to sit in the sun and remember happier days. And in Phoenix, 190 miles away, engineers and construction crews prefer to sit in the shade and reflect upon the tormenting problems that earned the project the name of "Aspirin Oval."

FORD ENGINEERS CHOOSE ASPHALT

The Ford Motor Company wanted the best high-speed track that $1,500,000 could buy. This called for pool-table-smooth straightaways and super-elevated curves constructed to the tightest tolerances ever attempted on a project of this kind. Original designs submitted by the Phoenix firm of Johannessen & Girand were for both asphalt and concrete. But after considering cost estimates and the feasibility of construction in the curves and transition sections, Ford engineers voted for asphalt.

Asphalt paving, they agreed, could provide the precision testing instrument which the automotive engineers needed—although it meant tackling one of the most ticklish paving operations ever undertaken. Design called for a track measuring 5.0000 miles, consisting of two one-mile straightaways with two 2500-foot circular curves and four transition slopes. Width of the track measured three 12′ lanes—36 feet—widening to more than 37′ on the surface of the full curves. Slopes on the curves ranged from 1% up to 62.5% with the entire super-elevation an approximate 7′.

Surface smoothness tolerance was fixed at not greater than 1/8″ longitudinally or transversely on a 10′ straight-edge. This was the exacting package that was turned over to the Fisher Contracting Company of Phoenix.

In designing the control elevations for the transitions, curves and straightaways, more than 12,000 separate computations were involved in establishing the exact elevation at each point. These elevations were computed to the 1/1000 of a foot. They were set at 25′ intervals longitudinally and at 2′ intervals transversely.

SUBGRADE PREPARATION AND PAVEMENT STRUCTURE

Preparation of the 9″ subgrade called for the movement of 380,000 cubic yards of material. Embankments were formed in horizontal layers 8″ deep by five scrapers. After watering and rolling, these embankments were cut to design elevation and cross-section by a blade equipped to fit the curve at a 35-degree angle.

The 6″ aggregate base course was watered and rolled in the conventional manner on the straightaways. On the curved sections it was windrowed, watered and mixed at the bottom of the slope and placed by a dozer. Compaction was accomplished by a 50-ton pneumatic-tire roller and a 10-ton tandem steel-wheel roller. On the curves, the aggregate base course was carried to a width of only 24′—two full lanes. The outer 12′ on the curves involved a change in design to an asphalt macadam base course on the compacted subgrade.

Paving the steep slopes on the curves required a blend of artistry and ingenuity. The asphalt finishing machine had to be sky-hooked to a tractor traveling the rim of the embankment while a crane standing at the base line fed the hot-mix into the hopper of the spreader. This was done for laying both the 1½″ asphaltic concrete levelling course and the 1″ asphaltic concrete wearing course.

FINISHING MACHINE MODIFIED

To maintain precision control of the spreading operation major modifications in the finishing machine had to be made in the Fisher company's shops. For instance, a divided plate was placed in the center of the hopper to direct the paving mixture to the high side of the screw conveyors. This had to be done to get sufficient hot-mix to the extreme high side of

the screed. The screed itself had to be modified to fit the curves. This was complicated by the fact that the screed had to be adjustable to conform to slope changes which occurred every 25′ in the transition sections.

Even tougher was the problem of compacting the asphalt mixture. This required a complex system of counterweights to accommodate the movements of the 10-ton roller which was supported on the slopes by steel cable strung to a tractor on the embankment rim. These weights had to be changed frequently to maintain proper equilibrium among the various forces acting on the roller. This was the responsibility of the tractor operator.

Similarly, it was the responsibility of the operator on the pilot tractor to maintain the correct amount of weight and restraint on the finisher. The finisher operator controlled the machine for direction and even distribution of the paving mixture. Two additional operators did guard mount on the right rear of the machine. One controlled mat thickness, the other made the joints and assisted in making screed adjustments.

The levelling course was permitted to vary not more than ¼″ from designed elevations. It was laid after the aggregate base had been primed with a medium curing cutback asphalt (MC-1) applied at a rate of 0.20-0.50 gallon per square yard. (A 100-200 penetration asphalt cement was used to treat the macadam base on the upper lane of the curves at a rate of 0.30-0.50 gallon per square yard.) An emulsified asphalt tack coat was applied before the 1″ top course of hot-mix asphalt was laid.

Even in the application of the liquid asphalts special equipment had to be devised. A conventional distributor was used to prime the two inner lanes of the track, but a special projecting spray bar had to be constructed for spraying the top lane on the curving sections.

Such were only some of the headaches encountered in the building of this test strip on Ford's 3,840-acre proving ground 25 miles south of Kingman on U. S. Highway 66. Each major headache, in turn, sired countless throbbing attacks of migraine for the engineers who designed and built the track. The phrase, "Aspirin Oval," was not loosely used.

ENGINEERING TRIUMPH

The end product, however, was a triumph of engineering, superlative construction practices and asphalt technology. So precisely was the track engineered and built that the mechanic test drivers can bore into the banked curves at 90-100 miles an hour and allow the flawless asphalt surface to carry the racing automobile safely around the curve without a guiding hand on the wheel.

Out there in western Arizona, where the desert laps against the Black Mountains, the consulting firm of Johannessen & Girand and the Fisher Contracting Company accomplished a remarkable feat with 106,000 square yards of modern asphalt pavement—and a king-size bottle of aspirin tablets.

So precisely engineered is the Ford Test Track that test drivers can safely bore into the banked curves at 90-100 miles an hour without a guiding hand on the wheel.

THE QUIET REVOLUTION IN ROAD BUILDING

An engineer takes density samples of an in-place roadbed soil to determine future compaction.

Fifty years ago, teamsters shuttling crude out of the early California oil fields made an interesting discovery. Drippings from the tank wagons mixed with the natural soil to form a primitive asphalt pavement.

From this humble beginning the use of "road oil" as a dust palliative spread swiftly until, in 1929, a county engineer was able to report to a gathering of asphalt technologists that in Fresno County, Calif., alone, more than 3,000 miles of roads were given an all-weather surface by penetrating and mixing the native soil with asphaltic road oil.

It's a long jump in time and space from California in 1907 to Delaware in 1957. In the intervening years the feverish search for improved machine-laid pavements to carry the rising flood of motor traffic placed the stigma of obsolescence on road-oiling. But, in the meantime, the archaic use of asphaltic crude as a dust palliative has quietly yielded to the flourishing science of soil stabilization with refined asphalt products.

HUGE PROGRAM IN DELAWARE

So, when the Delaware state legislature last year directed the state highway department to pave every mile of highway and byway in the state during a 10-year crash program, the engineers turned to the infant science of soil stabilization for the answer. Some experimental work with other forms of stabilization will be done but, for the backbone of the 2,000-mile project, Delaware will depend on asphalt stabilization.

Two methods of beefing up their natural soil roads (mostly sand and sandy silt) are being employed by the Delaware engineers. In one instance material is bladed from the existing roadbed into windrows. Then a traveling mixer picks it up and mixes it with an inverted emulsion made from a rapid-curing cutback asphalt at a calculated rate of approximately two gallons per square yard to achieve a 4″ thickness after compaction.

The alternate method is by scarifying the existing roadbed, then traversing it with a distributor which spreads the emulsion at a rate of between 0.5 and 0.6 gallon per square yard. Following this comes the traveling mixer which blends the soil and the asphalt. This procedure is repeated three or four times until the mixture is thoroughly blended; then the surface is compacted.

In both instances, Delaware engineers place a double bituminous surface treatment on this stabilized base.

Similar types of construction can be found on upwards of 30,000 miles of roads on state highway systems in the United States. Meanwhile, however, engineers are acquiring a new respect for the remarkable bearing value of hot-mix sand-asphalt bases which have proved so satisfactory in Florida and South Carolina and on much of New Jersey's new Garden State Parkway.

The sand-asphalt base has also been let to contract on the highly publicized Interstate System in Oklahoma where soil stabilization with asphalt has been practiced for many years. The western stretch of U.S. 66 through that state has employed the sand-asphalt hot-mix concept in its base construction.

ADVANTAGES OF SOIL STABILIZATION

The advantages of this technique, of course, are obvious. Many areas in the United States are lacking in adequate supplies of aggregates. Others face the gloomy prospect of early exhaustion of these limited resources. However, where the supply of local sand materials is generous, asphalt stabilization is offering a promising answer to many engineering problems.

Wherever the natural soils can be strengthened through asphalt stabilization, pavement designers may reduce the thickness of the upper courses with a corresponding reduction in the need for costlier imported aggregates. This is the key which has unlocked a whole new storehouse of possibilities for asphalt—the world's most versatile engineering product.

Picking up soil for transportation to road site. Later, soil will be mixed with emulsified asphalt for highway base course.

EXTRA ADDED ATTRACTIONS FOR DRIVE-INS

In nearly every form of recreational facility, asphalt pavement plays a highly notable and pertinent role. It provides an excellent surface for outdoor tennis and basketball courts and for multi-purpose playgrounds of all descriptions. It is widely used in the construction of swimming pools. Asphalt groins are successfully protecting our vanishing shoreline, including some of our finest beaches, against wind and wave erosion. And asphaltic materials are even paving movie theatres—hundreds of them. The outdoor type, that is.

Piling the family into the car for an evening at the local, open-air drive-in theatre has become a highly popular pastime within recent years. Proof of this is seen in the tremendous growth of the outdoor cinema business—from approximately 2000 of these roofless arenas in 1950 to more than 4000 in 1957. Bigger and better ones are being installed every year.

AMUSEMENTS FOR ALL

In a supreme effort to drag Mr. and Mrs. John Doe and their kids away from the television set and out into the car, theatre managers nowadays are offering the best in movie fare. The B-picture was once the stock-in-trade of the drive-ins. Not any more. A good many of these star-lit emporiums are projecting the very latest Hollywood extravaganzas. Also on hand may be various kinds of pre-movie and intermission

An added attraction of the new Queens Chapel Drive-In Theatre, near Washington, D. C., is its asphalt-paved parking area, which eliminates mud and dust nuisances. Asphalt paving keeps maintenance costs low and customer satisfaction high.

diversion. For the children, playgrounds and merry-go-rounds keep them occupied until show-time; for the adults there's dancing, deck tennis and even live entertainment.

But even though managers are aware of the need for added attractions to bring in the customers, they also realize the value of a soundly built establishment. Mud and dust, for example, just don't belong in an open-air theatre, for obvious reasons. The easiest and most economical method of eliminating these nuisances is with some type of asphalt surfacing. In new construction as well as the improvement of older installations, asphalt pavement, ranging from surface treatment to heavy-duty hot-mix type, is finding wide use.

ASPHALT STAGE CONSTRUCTION

Among the recently constructed outdoor movie theatres paved with asphalt is Queens Chapel Drive-In in Hyattsville, Maryland, a suburb of the Nation's Capital. Located for convenient access on what was once a private airfield, this sizeable spot opened in July 1955 sporting a single asphalt surface treatment, consisting of rapid-curing cutback asphalt (RC-2) and a layer of pea gravel. Observing stage construction practices, an outstanding feature of asphalt paving, a second treatment was applied shortly thereafter. In the spring of 1956, after the surface had thoroughly settled, 2" of heavy-duty hot-mix asphalt was laid over approximately one-half of the 40,000-square-yard area. This was done principally in the areas receiving the hardest wear.

With room for 1500 cars, Queens Chapel uses the most modern projection equipment. Its 65' x 148' screen is said to be the world's largest. Each car is provided with an individual speaker and, in cold weather months, individual car heaters are available. Centrally located is a fully air-conditioned and generously equipped snack bar—particularly inviting during the warm summer months. This all-weather outdoor exhibitor also furnishes a play area for the children. A recent experiment with live professional talent for pre-show and intermission entertainment proved so successful that negotiations are in progress to schedule it regularly, perhaps once or twice a month. Thus, many of the conveniences and attractions of the in-town movie house are making their way to the outdoor drive-in, which occasionally adds innovations of its own. Most of them have a carpet on the floor, too. It isn't velvet, but it's the next thing to it—velvet-smooth, rugged and durable asphalt pavement.

Queens Chapel theatre manager Ted Schiller has received much favorable comment from his customers on the smooth, dust-free, mudless parking ramps. "The real value of asphalt surfacing, though," he says, "is that it reduces maintenance costs over a long period of time. And to theatre owners, that represents a tremendous saving."

PROVEN ASPHALT DESIGN O

The heavy-duty asphalt pavement on seven miles of U. S. 99 in northern California has needed practically no maintenance during ten years of superior service. This is one of the short four-lane sections on this stretch of highway.

Traversing the northern end of the historic Sacramento Valley and the Sacramento River Canyon, U.S. Route 99 is one of the Pacific Coast's most heavily traveled routes. This important north-south highway affords vacationers and sportsmen access to the popular Shasta Lake Recreation Area and Mt. Shasta, a snowy volcanic cone rising almost two miles above the surrounding terrain.

In this rugged country state highway engineers in 1947 surfaced a 7.1 mile stretch of U.S. 99 with heavy-duty asphalt paving. Today this entire section of highway, near the town of Red Bluff, is providing superior, dependable service for the thousands of vehicles that travel it annually. According to maintenance superintendent E. R. Delano, in charge of the area, the pavement on the travel lanes has required practically no maintenance during the ten-year period.

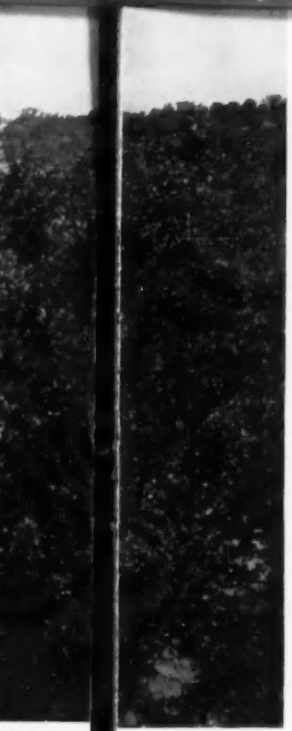
IMPORTANT DESIGN FEATURES

Engineers attribute this excellent service record to several significant design features. These include: (1) a pavement structure entirely adequate for the amount and weight of traffic carried during the ten-year period; (2) an open-graded hot-mix asphalt binder course that absorbs any possible faulting in the base; (3) side drainage of this open-graded mix that prevents the accumulation and ponding of water; and (4) a relatively thin hot-mix asphalt surface course supplying a tough, durable, waterproof roof over the underlying structure. This rugged, resilient carpet absorbs, without cracking, the deflections caused by heavy wheel loads.

The pavement structure of this fine highway consists of a 15″ subbase of clean, sandy gravel, a 6″ treated base of screened gravel, and 3″ of asphaltic concrete. The asphalt surfacing was laid in two lifts, an open-graded binder and a dense-graded surface course topped with a fine chip seal. Each asphalt pavement lift covers both the 22′ heavy-duty area and the 12′ outside shoulders. The shoulders also have an asphalt seal coat placed without aggregate cover to provide traffic lane delineation.

LOCAL MATERIALS—LOWER COST

Asphalt construction usually enables contractors to make extensive use of local materials, a prime reason for its lower initial cost. In this instance, the aggregate needed for the subbase—high quality, clean sandy gravel—was obtained from two nearby sources. The imported borrow placed on the southern two miles of the project was obtained from a gravel deposit 1½ miles west of U.S. 99 on the county road to Hooker. The material placed on the northern part was taken from a gravel bar in a stream-bed immediately west of the highway. A 12-ton



N ON

U.S. 99

tamping roller and a 3-axle steel wheel roller accomplished subbase compaction.

Aggregate for the treated base was removed from a gravel bar in nearby Cottonwood Creek. It was produced by screening the creek-run material through a 1″ sieve. The 1″ rock retained on the sieve was crushed to produce aggregate for the hot-mix asphalt pavement.

The base was spread in one lift to a width of 23′ with a D-8 tractor with bulldozer. The latter, modified by the contractor for use as a spreader, provided a motor-driven screw for distributing the material uniformly across the dozer blade. Ends, or wings, were added to prevent material from spilling over the ends of the blade. Depth of the spread was controlled by supporting the adjustable dozer blade on two large rubber-tired wheels.

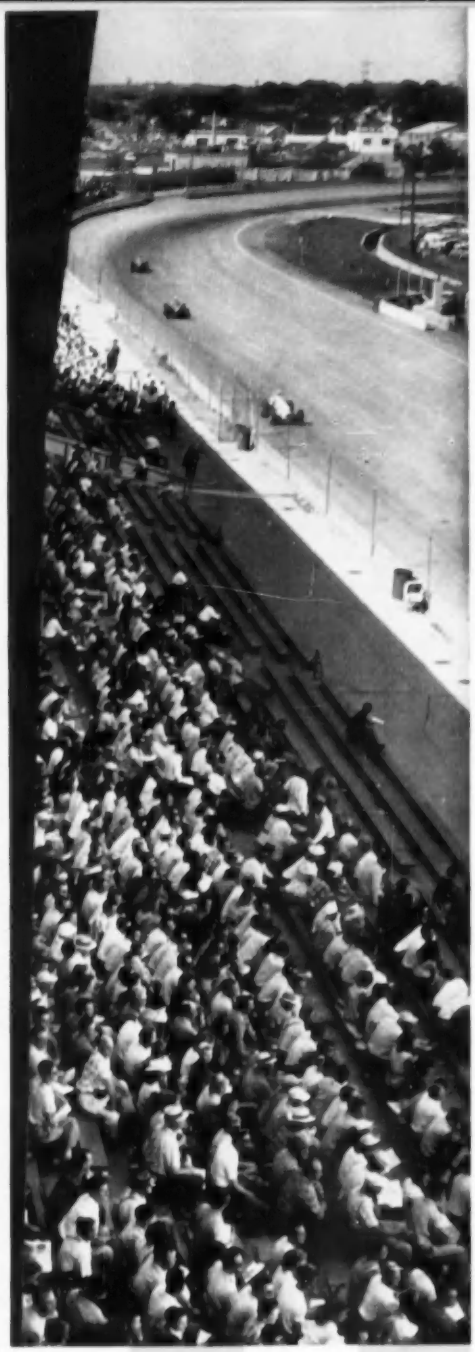
PRACTICAL CONSTRUCTION PRACTICE

A 16-ton, 3-axle tandem roller compacted the base, which was afterwards trimmed to grade by a motor patrol. The surface was then rolled with a pneumatic-tire roller and a seal of emulsified asphalt applied at the rate of 0.2 gallon per square yard. This seal also served as a tack coat in the central portion of the road-bed, but a medium-curing cutback asphalt prime coat (MC-2) was applied to the shoulder areas before placing the asphaltic concrete. The prime coat was spread at the rate of 0.25 gallon per square yard.

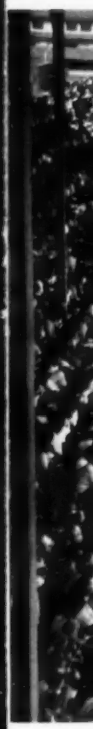
On small portions of the project the new asphalt paving was placed on an old, worn slab pavement. In these areas the contractor laid over the slabs a 6″ gravel base course. This he covered with an inch of dense-graded asphalt hot-mix, consisting of uncrushed aggregate passing the 1″ screen mixed with 120-150 penetration asphalt cement. Then a paving machine laid the 3″ binder and surface courses, as described above, in three spreads: a center spread of 10′ and two outside spreads of 12′ each.

IT'S HERE TO STAY

The modern asphalt pavement on U.S. 99 has stood the test of a decade of heavy traffic with noteworthy success—an outstanding compliment to the planning and foresight of the engineers of the California Division of Highways. Carefully designed with an eye toward future anticipated traffic, this highway should continue to give fine performance with no more than an occasional asphaltic treatment or thin layer of economical hot-mix to strengthen it for increased traffic loads and maintain it indefinitely in top, smooth-riding condition.



AUTO RACING AT ITS BEST — ON ASPHALT!



NEXT to the fabulous Braves, the hottest sports item in Milwaukee during the warm-weather season is automobile racing at the Wisconsin State Fair Grounds. Located just a stone's throw from Lake Michigan in West Allis, the multi-action track each year draws nearly 200,000 of the faithful to watch their favorites roar around the oval at speeds up to 125 m.p.h. The good burghers of Milwaukee claim the number of championship races held at the Fair Grounds each year places it second only, in big car racing, to that mecca of motorized madness, Indianapolis.

SPEED RECORDS SET — ACCIDENTS REDUCED

One of the biggest single contributing factors to the ever-growing popularity of this high-powered sport among Milwaukeeans is the asphalt-paved one-mile track at the Grounds. Completed in time for the 1954 season, the paved track replaced the dirt oval on which auto and harness racing had been held for some 50 years. Now three years old, it has proven its worth in all the areas that its promoter, Fair Grounds Manager W. M. Masterson, predicted it would. Bigger crowds have turned out every year; new speed records have been set (in one instance a record established only two and one-half weeks before was broken); and there have been considerably fewer injuries. In fact, in its first year, no one was injured in the six national championship races, nor was a driver or spectator fatally injured during the entire season of this dangerous, thrill-a-minute sport.

The all-weather strip has also made a big hit with the

A near-capacity crowd at the Wisconsin State Fair Grounds witnesses a new concept in auto racing. Records show that the asphalt-paved one-mile track provides safer, faster, cleaner racing in good weather or bad.

drivers. With asphalt, conditions are the same for each car that enters a race. On the old dirt track the drivers who drew early qualifying numbers had a considerable advantage because the track became slick and rough. It used to be, too, that not more than two cars dared drive abreast on the turns for fear of side swipes. Drivers now find they can safely run four abreast on the smooth, paved surface. They have more confidence in what their rivals can do on the tire-hugging, textured pavement.

Elimination of the dust nuisance and ability of the management to maintain scheduled racing dates in wet weather are other features the new course offers. In the 1957 season, three of the four principal races, including the marathon 500-mile test during Fair Week, would have been postponed had they been scheduled on the old dirt track. Heretofore, the fan in the corner "thrill seat" always expected to go home covered with mud or dust. The heavy-duty asphalt surfacing put a stop to that. No longer do clouds of dust obscure the view or blanket the spectators.

WELL-COMPACTED BASE

The new track has been built up from the original dirt harness and auto track. After a half-century of compaction by horses, sulkies and souped-up buggies, the course constitutes an excellent foundation for the heavy-duty pavement structure. The pavement, which varies in width from 70′ on the stretches to 65′ on the steeply banked turns, consists of 2″ of economical hot-mix asphalt laid over a 9″ thickness of compacted crushed stone. To date it has required virtually no maintenance.

Providing a race for practically every taste, the paved one-miler encloses a half-mile dirt track for motorcycle and harness racing, a paved two-mile obstacle course for sport cars, and a quarter-mile dirt oval for modified stock car racing. The quarter-mile and the half-mile tracks are strategically located immediately in front of the grandstands and within the illuminated area to afford excellent viewing for night exhibitions.

Billed now as the Fair Grounds' "big sport," supplanting harness racing, auto racing on asphalt is giving the fans an exciting new experience. They are witnessing a faster, safer and cleaner sport. The drivers agree that auto racing is a healthier business all around, since dirt and flying rocks on the paved oval are a thing of the past. Attendance records indicate the attraction will be getting even more support in the future. And the boys in the pit crews, and the drivers, figure that as the track becomes seasoned with time, it will be a still better course.

This is the story of all well-built modern, heavy-duty asphalt pavements. Rugged, super-smooth and durable when first laid down, they get even better as time goes on. And when smoothness needs to be restored to the surface, a speedily applied, economical asphaltic surface coat will do the trick.

These civil engineering instructors and faculty members participated in the courses in advanced study of asphalt paving technology held at the University of California this summer.

A Successful Summer of Advanced Asphalt Study at U. of California

"IT was one of the finest classes I have ever attended."

Such was the general consensus of the twenty-one civil engineering instructors from throughout the United States who traveled to Berkeley, California, to attend the University of California's program of advanced study in asphalt paving technology for nearly two months this summer. Held at the University's Institute of Transportation and Traffic Engineering, the combination of seminars and graduate courses was conducted by Professors R. Horonjeff, Carl Monismith, R. A. Moyer and H. B. Seed, I.T.T.E. staff members. The program dealt at an advanced level with the theory and design of asphaltic mixtures, including the design of highway and airport pavements.

As was the case a year ago when a similar summer program took place at Purdue University (see *AIQ*, October 1956) a grant made available by The Asphalt Institute enabled the award of substantial grants-in-aid to the program's participants. Funds for the Asphalt Institute grant were solicited by the American Petroleum Institute from the oil industry.

THE ROAD PROGRAM ON DISPLAY

THE main lobby of the U. S. Department of Commerce Building in Washington, D. C., served as the setting this summer for an impressive look into the future of American road-building. Invited by the sponsoring U. S. Bureau of Public Roads, The Asphalt Institute and eleven other organizations intimately concerned with highway construction, safety and use participated in a special exhibit designed to acquaint the American people with the great new federal-aid highway program. In line with the exhibit's theme, the National System of Interstate and Defense Highways, the participants, each by means of striking displays involving photographs and models, stressed their organization's contribution to better highways in terms of services, products, and economic, industrial and technical development.

In a special ribbon-cutting ceremony Federal Highway Administrator Bertram D. Tallamy officially opened the exhibit on June 22 and personally inspected each display. Hundreds of tourists, out-of-town businessmen, government employees and native Washingtonians visited the show daily. It terminated on July 21. Other participants, in addition to The Asphalt Institute were: American Automobile Association, American Institute of Steel Construction, American Road Builders' Association, American Trucking Associations, Associated General Contractors of America, Automobile Manufacturers Association, Automotive Safety Foundation, National Highway Users Conference, Portland Cement Association.

Federal Highway Administrator B. D. Tallamy (left) and Asphalt Institute Information Director R. C. Dresser inspect Institute exhibit in foyer of U. S. Department of Commerce Building, Washington, D. C.

THE ASPHALT INSTITUTE

EXECUTIVE OFFICES AND LABORATORIES
Asphalt Institute Building
Campus—University of Maryland
College Park, Maryland

INSTITUTE ENGINEERING OFFICES

DIVISION I—ATLANTIC-GULF

NEW YORK 20, N. Y.—1270 Avenue of the Americas
New York City, Long Island and New Jersey

BOSTON 16, MASSACHUSETTS—419 Boylston Street
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont

ALBANY, NEW YORK—11 North Pearl Street
New York State (except New York City and Long Island)

HARRISBURG, PENNSYLVANIA—800 North Second Street
Delaware, Pennsylvania

RICHMOND 19, VIRGINIA—Travelers Building
District of Columbia, Maryland, North Carolina, Virginia

ATLANTA 9, GEORGIA—881 Peachtree Street N.E.
Florida, Georgia, South Carolina

MONTGOMERY 4, ALABAMA—79 Commerce Street
Alabama, Tennessee

NEW ORLEANS, LOUISIANA—Maison Blanche Building
Louisiana, Mississippi

DIVISION II—OHIO VALLEY-GREAT LAKES

COLUMBUS 15, OHIO—Neil House
Indiana, Kentucky, Michigan, Ohio, West Virginia

LANSING 16, MICHIGAN—109 West Michigan Avenue
Michigan, Northern Indiana

LOUISVILLE 7, KENTUCKY—4050 Westport Road
Kentucky, Southern Indiana

DIVISION III—MIDWEST

ST. PAUL 4W, MINNESOTA—1951 University Avenue
Iowa, Minnesota, North Dakota, South Dakota

CHICAGO, ILLINOIS—6261 West Grand Avenue
Illinois, Wisconsin

KANSAS CITY 3, KANSAS—2500 Johnson Drive
Arkansas, Kansas, Missouri, Eastern Nebraska

DENVER 4, COLORADO—1250 Stout Street
Colorado, Idaho, Montana, Western Nebraska, Utah, Wyoming

DIVISION IV—SOUTHWEST

DALLAS 6, TEXAS—Meadows Building
New Mexico, Oklahoma, Texas

AUSTIN 1, TEXAS—Perry-Brooks Building
Texas

OKLAHOMA CITY 2, OKLAHOMA—Republic Building
Oklahoma

SANTA FE, NEW MEXICO—10 Radio Plaza
New Mexico, Western Texas

DIVISION V—PACIFIC COAST

SAN FRANCISCO 4, CALIFORNIA—Russ Building
Arizona, California, Nevada, Oregon, Washington

LOS ANGELES 17, CALIFORNIA—1709 West Eighth Street
Arizona, Southern California

SEATTLE 1, WASHINGTON—White-Henry-Stuart Building
Oregon, Washington

SACRAMENTO 14, CALIFORNIA—Forum Building
Central California, Northern California, Nevada

MEMBERS OF THE ASPHALT INSTITUTE

ALLIED MATERIALS CORPORATION
Oklahoma City, Oklahoma

AMERICAN BITUMULS & ASPHALT COMPANY
San Francisco, California

AMERICAN OIL COMPANY
New York, N. Y.

AMERICAN PETROFINA COMPANY OF TEXAS
Division of American Petrofina, Inc.
Dallas, Texas

ANDERSON-PRICHARD OIL CORPORATION
Oklahoma City, Oklahoma

ASHLAND OIL & REFINING COMANY
Ashland, Kentucky

THE ATLANTIC REFINING COMPANY
Philadelphia, Pennsylvania

BERRY ASPHALT COMPANY OF ARKANSAS
Magnolia, Arkansas

BERRY REFINING COMPANY
Chicago, Illinois

BIG HORN REFINING COMPANY
Lovell, Wyoming

BRITISH AMERICAN OIL CO. LTD.
Toronto, Ontario, Canada

BRITISH PETROLEUM COMPANY LTD.
London, England

BYERLYTE CORPORATION
Cleveland, Ohio

THE CARTER OIL COMPANY
Billings, Montana

CITIES SERVICE OIL COMPANY (PA.)
New York, N. Y.

COL-TEX REFINING COMPANY
Big Spring, Texas

COSDEN PETROLEUM CORPORATION
Big Spring, Texas

DERBY REFINING COMPANY
Wichita, Kansas

DIAMOND ASPHALT COMPANY
Chinook, Montana

DOUGLAS OIL CO. OF CALIFORNIA
Los Angeles, California

D-X SUNRAY OIL COMPANY
Tulsa, Oklahoma

EMPIRE PETROLEUM COMPANY
Denver, Colorado
Sheboygan, Wisconsin

EMPIRE STATE OIL COMPANY
Thermopolis, Wyoming

ENVOY PETROLEUM COMPANY
Long Beach, California

ESSO STANDARD OIL COMPANY
New York, N. Y.

FARMERS UNION CENTRAL EXCHANGE
Billings, Montana

ALEX G. FINNEY, JR.
Houston, Texas

HUNT OIL COMPANY
Dallas, Texas

HUSKY OIL COMPANY
Cody, Wyoming

HUSKY OIL & REFINING LTD.
Calgary, Alberta, Canada

IMPERIAL OIL LIMITED
Toronto, Ontario, Canada

KERR-McGEE OIL INDUSTRIES, INC.
Refining Division
Oklahoma City, Oklahoma

LEONARD REFINERIES, INC.
Alma, Michigan

LION OIL COMPANY
A Division of Monsanto Chemical Company
El Dorado, Arkansas

MACMILLAN PETROLEUM CORPORATION
El Dorado, Arkansas
Los Angeles, California

MALCO REFINERIES, INC.
Roswell, New Mexico

MONARCH REFINERIES, INC.
Oklahoma City, Oklahoma

NORTHWESTERN REFINING COMPANY
St. Paul Park, Minnesota

A.B. NYNAS-PETROLEUM
Nynashamn, Sweden

PHILLIPS PETROLEUM COMPANY
Bartlesville, Oklahoma

RAFFINERIE BELGE DE PETROLES, S.A.
Antwerp, Belgium

RICHFIELD OIL CORPORATION
Los Angeles, California

ROYALITE OIL COMPANY, LIMITED
Calgary, Alberta, Canada

SHELL OIL COMPANY
New York, N. Y.
San Francisco, California

SHELL OIL COMPANY OF CANADA, LTD.
Toronto, Ontario, Canada

SHELL PETROLEUM COMPANY, LTD.
London, England

SINCLAIR REFINING COMPANY
New York, N. Y.

SOCONY MOBIL OIL COMPANY, INC.
New York, N. Y.

THE SOUTHLAND COMPANY
Yazoo City, Mississippi

STANDARD OIL COMPANY OF BRITISH COLUMBIA, LTD.
Vancouver, B. C., Canada

THE STANDARD OIL COMPANY
(An Ohio Corporation)
Cleveland, Ohio

SUN OIL COMPANY
Philadelphia, Pennsylvania

TEXAS ASPHALT AND REFINING CO.
Houston, Texas

THE TEXAS COMPANY
New York, N. Y.

UNION OIL COMPANY OF CALIFORNIA
Los Angeles, California

WILSHIRE OIL COMPANY OF CALIFORNIA
Los Angeles, California

WITCO CHEMICAL COMPANY
Pioneer Products Division
New York, N. Y.

Printed in the U.S.A.